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Contact between parents and adult children: The role of time constraints, commuting and automobility

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ABSTRACT

Recent developments suggest that the need for contact between parents and adult children is expected to grow, while paid labour is re-organized to include more flexible work schedules and locations. In parallel we view a pressure to increase sustainable mobility through reducing car driving. Against this background, this paper addresses the question: to what extent the frequency of contact between parents and their adult children living out of home is associated with time allocated to work, including commuting time, and with automobility? Face-to-face and telecommunication based contact is considered. Regression analysis of survey data collected in the Netherlands was performed and results suggest that face-to-face contact was significantly associated with work and commute duration, car ownership, car commuting and distance. Telecommunication based contact was mainly associated with work duration, degree of urbanization and distance. Automobility seemed to be more important for women than for men. The policy implication is a potential trade-off between policies that aim at strengthening sustainable mobility behaviour and policies that lead to an increase in the reliance on informal care.

1. Introduction

Does it matter whether people have a car and how much time they spend on work for how often they see their parents? Whether face-to-face or technology mediated, contact between parents and their adult children is an important component of family solidarity: it facilitates the exchange of instrumental and emotional support and the generation of social capital (Astone et al., 1999; Furstenberg, 2005; Rossi & Rossi, 1990; Smith, 1998). Despite changes in circumstances over the life course contact is usually continuously maintained, for example because of feelings of obligation, reciprocity and mutual interest (Connidis, 2010; Grundy, 2005; Lee et al., 1994; Lye, 1996). In many countries it is expected that the importance of children as part of the social network of the elderly will increase, due to the parallel trends of the ageing of society and the decline of the amount of services provided by the state (for the Netherlands: Sadiraj et al., 2009). This likely increase in the need for contact is accompanied by changes in other domains that influence the opportunities for contact. A development with a potentially significant impact is the growing flexibility of work arrangements: the traditional separation of work and leisure is eroding in terms of when and where work is performed, especially with the advance of information technologies (Breedveld, 1998; Hilbrecht et al., 2013; Milss & Täht, 2010; Presser et al., 2008). Because of the centrality of work in many lives, changes in working hours, work location and commuting patterns are likely to introduce opportunities and constraints for contacts between parents and their adult children.

The developments in the family and in the work domains are closely linked to travel mobility, defined here as the means that allows individuals to combine geographically dispersed activities. Contact between parents and their adult children can take place either in the home of the parents or the children, at a third location or by using telecommunication. It is therefore likely that mobility will have an important role in the individual and household decision making process on how to join such contact with work related activities. The expected changes in the needs, constraints and opportunities for intergenerational contact discussed so far call for a closer look at the relationship between work, family and mobility.

In terms of its mobility requirements, maintaining contact with parents has two important features: first, it is a rather flexibly scheduled activity, which can take place not only during the week but also on weekends, and at different times during the day, and second, it is in many cases viewed as a social obligation. In this respect, the relationship between contact and automobility in particular is of central interest. The car is a flexible means of transport that may substantially expand the individuals' time–space prism in time geography terms and enable them to join work and necessary social contact in their daily lives. The potential implications of these features for society are a conflict between the different goals of pursuing sustainable mobility by reducing car use and enabling people to fulfil their caring obligations. More insight into

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the role of automobility in intergenerational contacts might help find ways of better dealing with this potential conflict.

The main research question of this paper is therefore to what extent the frequency of contact between parents and their adult children living out of home is associated with time allocated to work, including commuting time, and with automobility. I define automobility as having a car available and commuting to work by car. Previous studies on social contact and mobility indicated that spending more time on work-related activities reduces the frequency of social contact (e.g. Van den Berg et al., 2013). A drawback of these studies is that often no differentiation was made between types of social relationships, such as those with friends, siblings or parents, although it has been demonstrated that significant differences exist among these types of contact (Mok et al., 2010). This lack of distinction thus far prevented researchers from addressing specific features of intergenerational contact, such as its relatively flexible but obligatory nature, which have implications for the derived travel behaviour, especially for the role of the car. While individuals may choose with whom from their friends' circle they wish to keep in touch, when it comes to contact with parents they do not have alternatives. They are required to fit this activity into their schedule using the time budget and mobility resources available to them. A contribution of this paper is the specific focus on family contact as one of the most central social relationships individuals have. The paper also contributes to the prolific family sociology literature on intergenerational contact by including the geographical context and (auto)-mobility which in general are not considered in the analysis.

To address the research question I used the first wave of the Mobility in Social Networks module, survey data collected in 2009 in the Netherlands. This module is part of the Longitudinal Internet Studies for the Social sciences (LISS) panel administered by CentERdata. I estimated ordered probit regression models to estimate frequency of face-to-face and telecommunication based contact between parents and their adult children.

2. Background

Time geography is a conceptual framework that relates human activity with two main dimensions, namely time and space (Hägerstrand, 1970). With a daily 24 h time budget, individuals participate in activities based on their ability to move between locations in a timely manner. Of particular importance here are two sets of constraints that individuals must negotiate in their daily lives: first, capability constraints, from which the locations accessible to a person given the speed he or she can travel are derived. Secondly, coupling constraints, which define the ability to participate in activities that involve other individuals or organizations, and thus require the coordination of schedules. Obligatory activities that are fixed in time and space, such as full time office work, limit the choice set of other activities a person can take part in. All secondary, more flexible activities like socializing with family and friends, are scheduled given the temporal–spatial constraints imposed by those fixed activities — the person needs enough time left for the activity and the physical ability to get there on time (Neutens et al., 2011; Schwanen et al., 2008). For employed individuals work is the most time exhausting activity of the day and longer working hours naturally reduce the time budget for doing other things. This is especially true for rather flexible social activities (Golob & McNally, 1997).

Another relevant approach towards work and family related activities originates in psychological research on family and work interfaces. Time spent on work exerts what Voydanoff (2005) terms time-based demands and strain-based demands on the individual, while commuting exerts what she terms boundary-spanning demands. Time-based demands basically mean that time spent on work is subtracted from total available time. Strain-based demands are "the psychological spill-over" from work into family life, as is for example the stress caused at work which might impact family relationships. Boundary-spanning demands stem from the linkages of work and family and the lack of clear separation between the two. It has been previously shown that time individuals spend on work and on commuting is negatively associated with various indicators of the quality of *intra*-household family life. For example in the US, long working hours of men were negatively associated with time spent with spouse and with the quality of father-adolescent relationship (Crouter et al., 2001). In Sweden being a long distance commuter has been found to be associated with a higher probability of separation (Sandow, 2013). Work hours and commuting time have been found to be positively associated with work-to-family conflict (Voydanoff, 2005).

Derived from the two above mentioned approaches the straightforward hypothesis is that work and commute duration would be negatively associated with frequency of contact between parents and their children (Hypothesis 1). However because telecommunication based contact is less time consuming as it does not involve travel, it is hypothesized that the effect of work and commute duration would be smaller for this type of contact. It should be noted that the link between the duration of work related activities and family life is not as trivial as it may seem. Work hours were repeatedly found not to be associated with amount of care provided by children to parents (Dautzenberg et al., 2000; Starrels et al., 1995). A suggested mechanism is of time re-allocation from lower priority activities into activities of greater importance. For example in the case of mothers, the increase in their labour market participation (in terms of out-of-home work hours) appeared not to have resulted in a decrease in time they spent on childcare (Bianchi, 2000).

Although time spent at work is an important indicator of time budget constraints, one needs to differentiate between individuals working the same amount of time but under different arrangements, specifically those who work from home and those who do not. This distinction is important in light of the increase in the share of individuals who work at least partially from home or have other flexible work arrangements (Alexander et al., 2010; de Graaff & Rietveld, 2007). Working from home shortens the transition time from work-related to other activities. Therefore it is hypothesized that it would be positively associated with frequency of contact (Hypothesis 2). Reduction of commuting time to practically zero is one of the benefits. But it might also burden participation in social activities by blurring the work-leisure separation (Voydanoff, 2005), which might negatively impact social contact in general and contact with parents in particular.

A central concept in time-geography is the time–space prism (Hägerstrand, 1970) which illustrates the potential geographic area accessible to individuals for participation in activities, given their location, duration, and speed of travelling. All activities are taking place within this prism. The prism expands when potential travelling speed increases and shrinks when speed decreases. Access to mobility resources, like car availability, increases the potential activity space and allows the individual to connect activities that occur remotely from each other by travelling within an acceptable time (Bertolini & le Clercq, 2003; Handy, 2006; Sheller & Urry, 2000). Face-to-face contact with parents frequently occurs in locations, like at the home of the parents (Rubin et al., 2014), that without a car might not be within the daily activity prism. It is therefore hypothesized that having a car in the household would be positively associated with frequency of face-to-face contact but not with telecommunication based contact (Hypothesis 3).

Having considered commute time and car availability, one also needs to pay attention to the regular use of cars in the daily lives of commuters. A person who drives to work may find it easier to chain other activities before or after it. Individuals that drive to work were also found to be more likely to use the car for in-home visiting of parents and siblings (Rubin et al., 2014). From this perspective it is hypothesized that commuting by car would be positively associated with frequency of face-to-face contact but not with telecommunication based contact (Hypothesis 4). However an ongoing debate takes place among scholars on whether the inherent characteristics of car usage as an activity performed frequently in solitude might generate negative impacts on the

social life of the individual. Notably Putnam (2000) put forward the suggestion that in the US, after waves of suburbanization which arguably increased car dependency, the increase in time spent commuting by car is associated with lower levels of involvement in community life and in social life in general. Some studies, especially in those using US data, found support for this suggestion (Farber & Páez, 2009). The alternative hypothesis is therefore that commuting by car would be negatively associated with frequency of contact due to the tendency of car-reliant persons to engage less in out of home activities.

The ability to participate in activities and link them within the daily schedule also depends on the geographical distribution of the opportunity structure, which is partly determined by the density of built environment. In highly urbanized areas functions such as opportunities for socializing are more concentrated and are more accessible while in less urbanized areas functions are more dispersed (Farber & Páez, 2011). This may explain why residents of low density areas were found to have less frequent face-to-face and telecommunication mediated contact with their social network (Van den Berg et al., 2009). While in travel behaviour studies including some measurement of the built environment is now mainstream, in sociological studies of intergenerational contact it is surprisingly not the case (e.g. Bucx et al., 2008; Grundy & Shelton, 2001; Van Gaalen et al., 2008) and so the evidence regarding interaction within the family is especially scarce. Except for density, other built environment measurements considered in the literature for predicting social interaction were for example distance to highway, to city centre and to a major train station (Sharmeen et al., 2014). These variables are assumed to effect social contact through influencing access and egress times (Van Wee, 2013). According to Van Wee (2013), in addition to density and distance, factors like the degree of land use mix and the neighbourhood design could influence travel behaviour in general and therefore might influence also meetings with relatives. In the context of the Netherlands a research investigating general social contact found that distance to a highway had a small negative impact on frequency while distance to a railway station had a positive impact. The distance to the city centre had no significant effect (Sharmeen et al., 2014). However, distance to transport hubs and to the city centre are at least to some extent correlated with density — for example, higher densities allow for a more efficient supply of public transport (see also: Cervero, 2002; Schwanen et al., 2004). Theory predicts that non-urban networks are more kin oriented than urban ones and hence in non-urban regions contact should be more frequent (Beggs et al., 1996). Some empirical evidence from the Netherlands previously supported the idea that in more urban areas face-to-face contact (but not telecommunication mediated) between relatives is less frequent (Tillema et al., 2010). But an older small scale study did not find conclusive support for an effect of urban density on intergenerational contact (Krout, 1988). Given the scarcity of earlier research no explicit hypothesis is drawn and the analysis here is used to provide some empirical findings.

An important part of the opportunity structure is determined by the distance of separation.

One finding which is repeatedly observed in research on frequency of contact for social purposes is that distance matters (Sharmeen et al., 2014). The farther parents and children live away from each other the less they see one another (Bucx et al., 2008; Fors & Lennartson, 2008; Grundy & Shelton, 2001; Mok et al., 2010). A "distance decay" was also previously found for the frequency of telecommunication based contact (Rossi & Rossi, 1990; Treas & Gubernskaya, 2012). For general social contact Frei and Axhausen (2009) found that the association of distance with frequency of contact depends on the mode of telecommunicating. No effect of distance was found for email communication, while SMS and telephone contact decreased with distance. Contrary to previous decades, nowadays monetary costs of many forms of telecommunicating are likely to be insensitive to distance. However it is clear that distance is not only physical but emotional — it is likely that distance is also associated with emotional distance between parents and their children. Looser emotional ties between adult children and their parents would be associated with larger distance separating them (Steinbach & Kopp, 2007). Another channel that might account for this is that telecommunication is used to facilitate face-to-face contact (Larsen et al., 2006; Mokhtarian et al., 2006) — organizing a meeting, discussing plans and exchanging experiences might constitute a large part of the ongoing intergenerational communication. Taking all of the above into account it is hypothesized that distance would be negatively associated with frequency of contact for face-to-face and telecommunication (Hypothesis 5). For both forms of contact cautious interpretation is necessary as it is likely that it is prone for self-selection bias as children who are less in contact with their parents and are not expected to regularly provide them care might choose to live farther away than others. In standard research designs the coefficient of this variable should therefore not be interpreted as causal.

3. Data and methods

The data used for this paper is the first wave out of three of the Mobility in Social Networks module, part of the Longitudinal Internet Studies for the Social sciences (LISS) panel administered by CentERdata. The data were collected in the Netherlands in 2009 through an internet based survey among a representative sample of Dutch speaking residents of the Netherlands, aged 16 and above (for a detailed description of the data, including sampling, response and representativeness, see: Scherpenzeel & Das (2010)). Since the purpose of the analysis is to study the association between time allocated to work and commuting and frequency of intergenerational meetings, the analysis sample consisted of those respondents who reported as being employed or self-employed at the time of survey. To exclude as much as possible cases of working students and retirees who might face a different set of constraints, the sample was further restricted to include only respondents at the main working age between 25 and 65 years old. Only respondents who were the head of household or the head's partner, had at least one parent alive, and did not live with any of their parents or siblings were included. The final sample consisted of 1228 adult child–parent dyads. The other two waves were collected only a short time after the first (in 2010 and 2011) and therefore did not contain enough cases with changes in the core variables of interest to justify including them in the analysis.

The main advantage of this dataset was that it included frequencies of encounters and contact between adult children and parents for all levels of frequency (from never to daily) in combination with data on travel mobility and work. Research that relies on travel diaries of a day or two often excludes social relationships and activities that are not captured within the recorded period (see: Larsen et al., 2006). A further advantage of the current survey is that it included information not only on the respondent but also about her/his respective parents.

Distance variables, measured at the 4-digit postal code level, were calculated using the distance matrix from the National Accessibility Map[1] (*Nationale Bereikbaarheidskaart*) from which road distances between every pair of locations were derived.

3.1. Dependent variable

Frequency of contact was measured separately for face-to-face meetings and telecommunication based contact. These two variables were measured from the perspective of the adult child by using the answers to two questions: "over the past 12 months, how often did you see your mother (or father)" and "over the past 12 months, how often did you have contact with your mother (or father) by telephone, mail, email or internet?". Answers to both questions were given on an ordinal 7-point scale of frequencies: never, once, a few times, at least monthly, at least weekly, several times a week, every day. Unfortunately no

[1] These data were produced by Goudappel Coffeng- http://www.bereikbaarheidskaart.nl/

information was included in the dataset on the main purpose of the meetings, usual day, time and the location of meetings. A separate set of questions asked specifically about in-home visits were analysed elsewhere (see Rubin et al., 2014).

3.2. Independent variables

Work duration was measured in hours as number of weekly work days multiplied by eight. Respondents were able to provide the number of weekly work days at one place after the decimal precision. While this clearly does not capture all employment arrangements accurately (such as full work days that are shorter than eight hours), given the available data it provides the best approximation for time spent at work. To capture variations in work location between a steady work place and home an indicator variable was used to measure whether respondents reported positive number of hours working from home. Commute duration was self-reported by the respondent in minutes and included in the models in hours. Commuting by car was measured using a dummy variable of whether the respondent reported commuting by car (or other motorized vehicle) or by a different mode (public transport, walking or cycling). Number of cars available in the household was recorded using three categories: none (reference), one, two or more. Degree of urbanization was measured at the 4-digit postal code level in three categories: high (more than 1500 addresses per km^2), medium (500–1500 addresses per km^2) and non-urban (fewer than 500 addresses per km^2, reference). The distance between the child's home and the parents' home was included in four categories in kilometres: 0–5 (reference), 6–20, 21–50, 51 and more. If the respondent lived in the same place of residence (Dutch: *woonplaats*) as her or his parent, then this would be regarded as zero kilometres distance.

The control variables were whether the respondent was female, respondent's age, age squared, whether the respondent was highly educated, whether the respondent had a partner, whether the respondent had a sibling, the age of the youngest child in the household (reference: no children in the household), being a home-owner, youngest parent's age, parental household composition (reference: both parents lived together; father lived alone; mother lived alone) and whether a parent was disabled or restricted in her/his daily activities.

3.3. Method

The dependent variables were measured on an ordinal scale, therefore ordered probit analysis was the appropriate method. Because of the potential correlation between face-to-face and telecommunication contact frequency at the individual level, a seemingly unrelated bivariate ordered probit regression analysis was conducted using the *BIOPROBIT* procedure in Stata (Greene & Hensher, 2010; Sajaia, 2008). For the two outcomes the model is given by these two equations:

$$y_{i,1}* = \beta_1' x_{i,1} + \varepsilon_{i,1},\ \mathrm{y}_{i,1} = j \ \text{ if } \ \mu_{j-1} < y_{i,1}* < \mu_j,\ j = 0, \ldots, J_1$$
$$y_{i,2}* = \beta_2' x_{i,2} + \varepsilon_{i,2},\ \mathrm{y}_{i,2} = j \ \text{ if } \ \delta_{j-1} < y_{i,2}* < \delta_j,\ j = 0, \ldots, J_2.$$

And the errors are assumed to be correlated:

$$\begin{pmatrix} \varepsilon_{i,1} \\ \varepsilon_{i,2} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 & \rho \\ \rho & 0 \end{pmatrix} \right].$$

Previously in transport behavioural context a similar procedure was implemented by Scott & Axhausen (2006) to estimate the dual decision on car ownership and public transport season tickets. This method takes into account the correlation of the errors between the two equations and therefore the models are more efficiently estimated. A useful feature of the model is the Rho correlation coefficient which measures the correlation between the two outcome variables.

4. Descriptive findings

4.1. Frequency of contact

The distribution of the two types of frequency of contact is presented in Fig. 1 and Fig. 2. Measured on a seven point scale, the most frequent answer for both types was "at least weekly". The sample mean face-to-face frequency was between at least monthly and at least weekly and the mean telecommunication contact is almost at least weekly. While not directly comparable, these figures are similar to those reported by Tillema et al. (2010) for face-to face and ICT contact with relatives in an urban region in central Netherlands. On the seven point scale, mean face-to-face frequency for females was 4.7 and telecommunications 5.0 (at least weekly). For males the means were slightly lower for both types of contact — 4.5 and 4.6 respectively. Face-to-face contact frequency was lower in highly urban areas, while telecommunication based contact frequency was higher. Compared across three types of residential locations in highly urban areas the mean face-to-face contact frequency was 4.4 (telecom: 4.9), in medium urban 4.8 (4.8) and in non-urban 4.7 (4.6).

4.2. Main explanatory variables

Descriptive statistics for all continuous and categorical dependent variables are presented in Table 1. Mean weekly work hours was around 35. For females — around 32 and for males — 39. 13% of the sample reported working at least one hour at home, with very small differences between males and females. Mean commute duration (one way) was 26 min, which is similar to the population mean in the Netherlands of 28 min (Gimenez-Nadal & Molina, 2014; Statistics Netherlands, 2013). Female commute duration (23.2 min) was around 6 min shorter than for males (29.2 min). 63% reported commuting by car, with 66% of males and 59% of females. Other reported commute modes were: public transport (8%), cycling (27%) and walking (2%). These rates are somewhat similar to the commute mode split of the whole population: car — 59%, public transport — 10%, cycling 23% and walking — 4% (Statistics Netherlands, 2013). In the sample there was a similar share of respondents living in high and medium degree of urbanization — around 42%. Only 15% of respondents lived in non-urban areas. Relative to the overall population of the Netherlands those living in medium degree of urbanization were over-represented, and those living in highly urban and non-urban areas were somewhat under-represented.

Table 2 details the distribution of the dependent variable for independent categorical variables. High frequency of face-to-face contact was particularly found for respondents who lived in medium degrees of urbanization, for respondents with children under the age of 6, and for respondents who lived up to 20 km from their parents. Low frequency of face-to-face contact was noted for respondents who lived in high

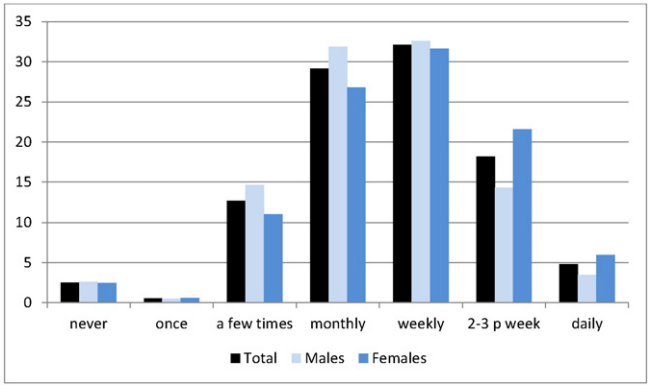

Fig. 1. Annual frequency of contact between respondents and their parents — face-to-face (%).

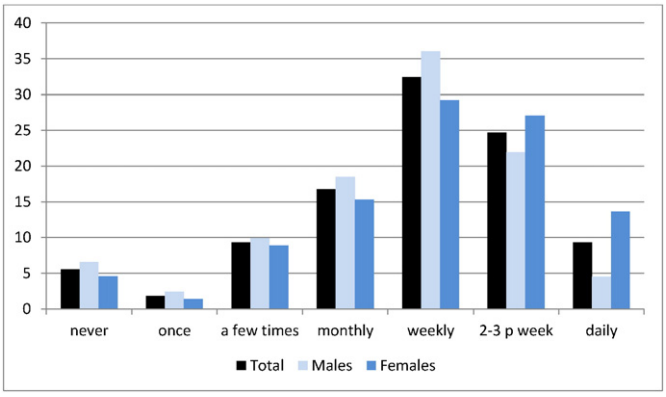

Fig. 2. Annual frequency of contact between respondents and their parents — telecom (%).

degrees of urbanization, for respondents who lived at least 51 km away from their parents and for respondents whose father lived alone. The highest frequency of telecommunication based contact was noted for respondents who (occasionally) worked from home, did not have siblings, had children under the age of 6, lived up to 5 km from their parents or whose mother lived alone.

5. Results

A system of two seemingly unrelated regressions was estimated. The results for the bivariate ordered probity analysis for the full (columns 1 and 2), the male (3 and 4) and the female (5 and 6) samples are presented in Table 3.

For all three models the Rho correlation coefficient measure is statistically different from zero, which implies that the two forms of contact are related. The correlation coefficient is highly positive indicating that while no definitive conclusions could be drawn, one can rule out substitution between face-to-face and telecommunication based contact, and that complementarity between the two is likely. Unobserved factors such as the degree of emotional closeness and general sociability might play a role in explaining both outcomes and contribute therefore to the correlation in the error terms of the two equations.

All models estimated are jointly significant, however the pseudo-R^2 indices of the bivariate ordered probit are relatively low — 0.055 for the full sample. In the case of the bivariate ordered probit regression analysis this measure combines the explanatory power of the two equations of the model. A further analysis (not shown) indicated that the model explains the variation in face-to-face meetings reasonably well (McFadden's R^2 of 0.134 for the full sample). As detailed below, the model for telecommunication based contact performs less well (McFadden's R^2 of 0.035). The model performs best for face-to-face meetings in the female-only sample: McFadden's R^2 of 0.145.

5.1. Face-to-face contact

Time spent on work ($p < 0.01$) and commuting time ($p < 0.05$) had a negative association with frequency of face-to-face contact, indicating that daily time constraints negatively impacted intergenerational contact (Hypothesis 1). The coefficient of weekly work hours was much larger than that of commute time. Working from home, however, had only

Table 1
Descriptive statistics for categorical and continuous independent variables.

		Total		Males		Females	
		Mean	sd	Mean	sd	Mean	sd
Work duration (hours)		35.29	8.65	39.24	5.99	31.82	9.12
Some work at home	No	0.87		0.87		0.88	
	Yes	0.13		0.13		0.12	
Commute duration (hours)		0.43	0.32	0.49	0.35	0.39	0.30
Commute by car	No	0.37		0.34		0.41	
	Yes	0.63		0.66		0.59	
Number of cars in hh	0	0.06		0.05		0.06	
	1	0.53		0.52		0.54	
	2+	0.40		0.40		0.40	
Degree of urbanization	High urban	0.43		0.45		0.42	
	Med. urban	0.42		0.41		0.42	
	Non-urban	0.15		0.14		0.16	
Age		41.77	8.95	42.3	8.99	41.30	8.90
Female	No	0.47					
	Yes	0.53					
Has partner	No	0.25		0.23		0.28	
	Yes	0.75		0.77		0.72	
Has siblings	No	0.06		0.07		0.06	
	Yes	0.94		0.93		0.94	
Age youngest child in hh	No child	0.43		0.43		0.42	
	0–6	0.22		0.24		0.20	
	7–12	0.15		0.15		0.16	
	13+	0.20		0.18		0.22	
Distance respondent-parent	0–5	0.44		0.42		0.46	
	6–20	0.20		0.20		0.20	
	21–50	0.14		0.15		0.12	
	51+	0.22		0.23		0.22	
Highly educated	No	0.59		0.56		0.62	
	Yes	0.41		0.44		0.38	
Home owner	No	0.20		0.19		0.21	
	Yes	0.80		0.81		0.79	
Age youngest parent		70.20	10.45	70.8	10.54	69.66	10.34
Parental household	Couple	0.54		0.51		0.56	
	Father only	0.13		0.13		0.12	
	Mother only	0.34		0.35		0.32	
Parent disability	No	0.45		0.51		0.41	
	Yes	0.55		0.49		0.59	

Table 2
Distribution of annual frequency of contact for face-to-face and telecommunication-based contact, by categorical independent variable.

		F2F			Telecom		
		Less than monthly	Monthly	At least weekly	Less than monthly	Monthly	At least weekly
Some work at home	No	15.6	29.4	55.0	17.4	16.9	65.7
	Yes	17.5	27.3	55.2	12.3	16.2	71.4
Commute by car	No	18.1	34.7	47.1	16.6	18.6	64.9
	Yes	14.4	25.8	59.7	16.9	15.7	67.4
Number of cars in hh	0	25.9	39.5	34.6	21.0	21.0	58.0
	1	14.8	31.3	54.0	16.7	17.5	65.7
	2+	15.5	24.6	59.9	16.1	15.1	68.8
Degree of urbanization	High urban	20.3	32.2	47.5	15.6	16.6	67.8
	Med. urban	11.9	26.3	61.8	17.0	16.0	67.1
	Non-urban	13.6	28.3	58.2	19.6	19.6	60.9
Female	No	17.8	31.9	50.4	19.0	18.5	62.5
	Yes	14.1	26.8	59.2	14.8	15.3	69.9
Has partner	No	14.2	32.2	53.7	16.1	15.4	68.5
	Yes	16.4	28.1	55.5	17.0	17.2	65.8
Has siblings	No	11.4	31.7	57.0	12.7	13.9	73.4
	Yes	16.1	29.0	54.9	17.1	17.0	66.0
Age youngest child in hh	No child	18.6	32.6	48.9	16.7	17.8	65.5
	0–6	11.3	26.0	62.6	13.6	15.1	71.3
	7–12	17.0	26.6	56.4	17.6	21.3	61.2
	13+	13.8	27.1	59.1	19.8	13.0	67.2
Distance respondent-parent	0–5	7.6	13.0	79.3	15.6	11.0	73.4
	6–20	8.5	27.9	63.6	17.4	15.0	67.6
	21–50	18.5	43.5	38.1	22.6	19.6	57.7
	51+	36.6	52.9	10.5	14.9	27.9	57.3
Highly educated	No	15.5	23.6	60.9	20.3	15.4	64.3
	Yes	16.2	37.3	46.5	11.6	18.8	69.6
Home owner	No	18.6	28.0	53.4	13.4	19.8	66.8
	Yes	15.1	29.5	55.5	17.6	16.0	66.4
Parental household	Couple	13.0	29.2	57.8	14.8	18.5	66.7
	Father only	24.5	31.6	43.9	29.7	22.6	47.7
	Mother only	17.0	28.2	54.9	15.1	11.9	73.1
Parent disability	No	17.9	28.7	53.4	17.2	18.3	64.5
	Yes	14.0	29.6	56.4	16.4	15.5	68.1

weakly significant ($p < 0.1$) and positive association with frequency (Hypothesis 2). In terms of magnitude this association was slightly stronger (in absolute terms) than the association between commute time and frequency.

Both variables indicating automobility (having at least one car in the household and commuting by car) were found to have a positive association with frequency of face-to-face contact (Hypotheses 3 and 4). However the estimated difference between having one car and having two or more cars was insignificant. This suggests that the main contribution to mobility is made by the first car, after which it does not make much of a difference how many cars a household owns. Considering that meeting parents is to some extent a group activity to which other household members might join, there might be smaller competition among household members for car usage beyond the first car. In a sensitivity test of alternative specifications, commuting by car (relative to other modes) kept the positive and significant association with frequency also when the dummy variable was replaced by a categorical variable of commute mode.

The association of degree of urbanization was only weakly significant ($p < 0.1$) and yet showed a distinction between the three categories. Relative to non-urban areas, living in high degree of urbanization was negatively associated with frequency of face-to-face contact, while living in medium degree of urbanization was positively associated. Hence, after controlling for all other variables, respondents who lived in suburban environments had a higher frequency of contact with their parents.

As expected, the strongest association of face-to-face contact was with distance — the longer the distance between the respondents and their parents, the lower the frequency of contact (Hypothesis 5). As noted above these associations are not necessarily causal, because those adult children who were in lesser contact with their parents might have preferred living closer to other activities, and thus farther away from their parents.

From previous studies it is known that women play a different role than men within the kinship network. For example, women are responsible for more care giving (Mulder & van der Meer, 2009; Rossi & Rossi, 1990; Silverstein et al., 2006). Indeed, gender was found to be significant: women have comparatively more frequent face-to-face and telecommunication based contact with their parents than men. Subsequently the role of gender was further explored in two ways: first the model was estimated separately for males and females (Table 3, models 3–6) and then the main explanatory variables were interacted with gender, each interaction in a separate model (Table 4, models 7–11). Gender differences were apparent for the two central concepts in this paper: time constraints and automobilty. In the male sample commuting duration was found to have a significant association with frequency, while work duration, number of cars in the household and working from home were insignificant. For women, work duration was significant and furthermore, it is clear that car availability is crucial to accomplish the task of combining work with family contact maintenance. Both variables that measure automobility were significant for women. Using a car for commuting was significantly associated with contact for women, and the difference between one or two (or more) cars in the household was larger for women than in the general sample. The importance of access to a car for women is also highlighted in the face-to-face models which included interaction variables. Of the five models estimated (Table 4) the two significant interactions were the interaction of being female with car commuting (model 10) and the interaction of being female with number of cars in the household (model 11). In both cases the interaction effects were positive, indicating the additional positive impact women get from car availability relative to men. The reader should note that no interaction with gender was significant in explaining telecommunication based contact.

Table 3
Results for bivariate ordered probit regression; dependent variable: frequency of contact.

Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	All				Male				Female			
	F2F		Telecom.		F2F		Telecom.		F2F		Telecom.	
Work dur. (in hrs)	−0.351	***	−0.310	**	−0.074		−0.260		−0.345	**	−0.275	*
	(0.124)		(0.123)		(0.266)		(0.264)		(0.150)		(0.148)	
Some work home	0.163	*	0.168	*	0.155		0.261	*	0.127		0.059	
	(0.097)		(0.096)		(0.142)		(0.140)		(0.137)		(0.135)	
Commute (in hrs)	−0.104	**	−0.060		−0.123	**	−0.054		−0.074		−0.066	
	(0.040)		(0.040)		(0.061)		(0.060)		(0.055)		(0.057)	
Commute by car	0.202	***	0.130	*	0.145		0.146		0.228	**	0.132	
	(0.072)		(0.071)		(0.110)		(0.108)		(0.099)		(0.097)	
# cars in hh (ref: 0)												
- 1	0.297	**	0.167		0.204		0.068		0.457	**	0.340	*
	(0.136)		(0.133)		(0.195)		(0.191)		(0.194)		(0.191)	
- 2+	0.315	**	0.202		0.100		0.018		0.610	***	0.430	**
	(0.153)		(0.150)		(0.216)		(0.212)		(0.221)		(0.218)	
Deg. of urban. (ref: non-urban)												
- Highly	−0.174	*	0.227	**	−0.254	*	0.245	*	−0.118		0.218	*
	(0.094)		(0.092)		(0.142)		(0.139)		(0.128)		(0.126)	
- Medium	0.159	*	0.199	**	0.015		0.194		0.281	**	0.187	
	(0.092)		(0.091)		(0.140)		(0.138)		(0.125)		(0.123)	
km distance child–parent (ref: 0–5)												
- 6–20	−0.517	***	−0.253	***	−0.480	***	−0.235	*	−0.572	***	−0.325	***
	(0.084)		(0.082)		(0.125)		(0.122)		(0.116)		(0.113)	
- 21–50	−1.036	***	−0.461	***	−1.124	***	−0.532	***	−0.969	***	−0.418	***
	(0.099)		(0.095)		(0.141)		(0.135)		(0.142)		(0.136)	
- 51+	−1.513	***	−0.412	***	−1.533	***	−0.460	***	−1.524	***	−0.394	***
	(0.089)		(0.081)		(0.133)		(0.120)		(0.123)		(0.112)	
Age	−0.165	***	−0.041		−0.135	***	−0.004		−0.203	***	−0.097	**
	(0.034)		(0.034)		(0.051)		(0.050)		(0.049)		(0.049)	
Age sq	0.002	***	0.000		0.001	***	−0.000		0.002	***	0.001	**
	(0.000)		(0.000)		(0.001)		(0.001)		(0.001)		(0.001)	
Female	0.121	*	0.244	***								
	(0.069)		(0.069)									
Has partner	−0.409	***	−0.153	*	−0.420	***	−0.022		−0.451	***	−0.287	**
	(0.084)		(0.082)		(0.127)		(0.124)		(0.116)		(0.114)	
Has siblings	−0.287	**	−0.332	***	−0.127		−0.281		−0.444	**	−0.407	**
	(0.124)		(0.123)		(0.176)		(0.174)		(0.182)		(0.181)	
Age youngest child in hh (ref: no child)												
- 0–6	0.462	***	0.166	*	0.375		0.015		0.586	***	0.325	**
	(0.094)		(0.092)		(0.136)		(0.133)		(0.135)		(0.132)	
- 7–12	0.253	**	−0.039		0.214		0.023		0.318	**	−0.054	
	(0.102)		(0.100)		(0.156)		(0.153)		(0.141)		(0.139)	
- 13+	0.223	**	0.004		0.143		−0.146		0.323	**	0.150	
	(0.092)		(0.091)		(0.142)		(0.140)		(0.126)		(0.124)	
Highly educated	0.021		0.130	**	0.120		0.203	**	−0.072		0.057	
	(0.065)		(0.064)		(0.096)		(0.094)		(0.091)		(0.090)	
Home owner	0.061		−0.138		0.019		−0.195		0.094		−0.072	
	(0.085)		(0.084)		(0.126)		(0.124)		(0.118)		(0.116)	
Age parents	0.009		0.006		0.008		0.004		0.010		0.009	
	(0.006)		(0.006)		(0.009)		(0.009)		(0.008)		(0.008)	
Parental household (ref: couple)												
- Father alone	−0.344	***	−0.362	***	−0.491	***	−0.363	**	−0.176		−0.305	**
	(0.100)		(0.098)		(0.148)		(0.145)		(0.139)		(0.137)	
- Mother alone	−0.184	**	0.125		−0.233	**	0.145		−0.130		0.117	
	(0.074)		(0.073)		(0.110)		(0.108)		(0.104)		(0.103)	
Parent disability	0.057		0.054		0.097		0.128		0.024		−0.009	
	(0.062)		(0.061)		(0.092)		(0.090)		(0.086)		(0.085)	
Constant	0.664	***			0.585	***			0.733	***		
	(0.033)				(0.048)				(0.045)			
ρ	0.581	***			0.526	***			0.625	***		
	(0.022)				(0.034)				(0.028)			
N	1228		1228		574		574		654		654	
ll	−3460				−1604				−1822			
ll_0	−3663				−1678				−1950			
Pseudo-R^2	0.055				0.044				0.066			
χ^2	481.5				211.8				278.2			

Standard errors in parentheses; * < .01; ** < 0.05; *** < 0.01.

Table 4
interactions of main explanatory variables with gender; dependent variable: frequency of contact.

Variables	F2F			Telecom		
	Coeff.	Std. err.		Coeff.	Std. err.	
(7)						
Work dur. (in hrs)	−0.055	(0.255)		−0.120	(0.251)	
Female	1.487	(1.026)		1.118	(1.013)	
Work dur. × female	−0.379	(0.284)		−0.243	(0.280)	
(8)						
Some work home	0.160	(0.134)		0.255	(0.132)	*
Female	0.120	(0.073)		0.267	(0.073)	***
Some work home × female	0.006	(0.183)		−0.174	(0.180)	
(9)						
Commute (in hrs)	−0.143	(0.061)	**	−0.048	(0.060)	
Female	0.197	(0.110)	*	0.220	(0.108)	**
Commute × female	0.073	(0.081)		−0.023	(0.079)	
(10)						
Commute by car	0.072	(0.100)		0.094	(0.099)	
Female	−0.026	(0.106)		0.203	(0.104)	*
Commute by car x female	0.232	(0.126)	*	0.064	(0.124)	
(11)						
# cars in hh (ref: 0)						
1	0.167	(0.185)		0.061	(0.181)	
2+	0.169	(0.197)		0.038	(0.193)	
Female	−0.273	(0.238)		−0.005	(0.233)	
1 car × female	0.291	(0.251)		0.223	(0.247)	
2+ car × female	0.621	(0.257)	**	0.337	(0.252)	

Notes:
a. Bivariate ordered probit regressions with dependent variable: frequency of contact.
b. Control variables in all five models : degree of urbanization, distance, age, age squared, has partner, has siblings, age of youngest child, highly educated, home owner, age parents, parental household.
c. Standard errors in parentheses; * <.01; ** <0.05; *** <0.01.

5.2. Control variables

All else equal older respondents see their parents less frequently than younger respondents. Having a partner is negatively associated with frequency of contact, potentially reflecting time budget effects of larger households with more complex activity schedules. Respondents with a partner may also need to include the partner's family in their personal network. The coefficient for having siblings has a negative sign as well, demonstrating the task-sharing among adult children of keeping in touch with their parents. Having young children has a positive association with the frequency of face-to-face contact. One reason for this is the informal childcare grandparents provide. This is in line with the argument that grandparents derive utility from contact with their grandchildren (Uhlenberg & Hammil, 1998). Having a father living alone is negatively associated with contact, relatively to when both parents live together and to when the contact is with a mother living alone ($p < 0.1$).

5.3. Telecommunication-based contact

Only a small number of variables were found to be significantly associated with telecommunication based contact. Car ownership and time spent commuting, which all appeared important for face-to-face meetings, were irrelevant for this activity (Hypotheses 1, 3). At the same time the variable for weekly work hours which measures the most important time constraint has a significantly negative association - to keep in touch one needs to have time. Commuting by car was only weakly positively significant (Hypothesis 4). The parameters for distance were highly significant as well - a clear negative association of distance and frequency was found (Hypothesis 5).

The largest difference between face-to-face and telecommunication based contact was found in the association with the degree of urbanization. Living in highly urbanized areas seems to be positively associated with telecommunication contact, but negatively with face-to-face contact.

The control variables reveal the expected gender effect, according to which women are more likely to have frequent contact with the family network (positive association of frequency with being female) and that keeping in touch with parents is shared among siblings (negative association with having siblings).

6. Conclusions and discussion

In this paper the relationship between work, commuting and automobility, and contact frequency with family members has been investigated. The main explanatory variables were time spent at work, commuting time, location of work, mode of commute, car ownership, degree of urbanization and distance between parents and their children. Evidence was found in support of several hypotheses: first, overall time spent at work and commuting time significantly constrain frequency of face-to-face contact. Second, car ownership was indeed positively associated with contact frequency. Furthermore, regular car use, as defined here, of commuting by car had a similar positive association with frequency of contact. These two findings support the hypothesis of the advantages inherent to car use of expanding the potential activity space. This conclusion is also supported by comparing males and females, where the contact between parents and females, who traditionally have more complex daily schedules, benefits more from car ownership and usage. Third, weak support was found for the hypothesis regarding the impact of the division of work between home and an outside-of-home location. Fourth, no negative association was found of degree of urbanization with frequency of contact. For telecommunication based contact a positive one has been found and for face-to-face only weakly significant associations were found. Lastly, as expected distance had a very strong and negative association with frequency of contact.

In general it was found that the main explanatory variables played only a small role in explaining frequency of telecommunication-based contact. Only time at work, degree of urbanization and distance had a significant association with frequency of telecommunication-based contact. For this mode of contact it seemed that gender and family composition were more relevant factors.

This paper contributes to the ongoing research on social activities by adding insight on a particular and important type of social activity — intergenerational contact within families, and by arguing the following points. First, as demonstrated here, time seems to be an important constraint on contact between family members. Unlike with other social activities, in the special case of contact with parents the individual has much less room for flexibility. From cultural and normative perspective meetings usually must take place and their location is to a certain extent fixed, and therefore also the distance is given. Secondly, the results demonstrate that individuals can better manage the temporal-spatial constraints by using the car as a flexible means of transport. These two perhaps unsurprising findings point out to a potential growing tension between the different obligations of employed individuals, which might have consequences from the perspective of transport behaviour and planning. As stated above, increasing demands to provide informal support in families and the demand for flexibility in the workplace are expected to create an increasing demand for car usage. However the transport landscape is also a constraint that the individual has to take into account and planning policies in this dimension that intend to reduce car use might therefore increase the work-family tension. Future research in how individuals juggle between these changing obligations and constraints to work and to family can help in finding ways of addressing these potential conflicts between sustainable transport development, the re-organization of care and support, and the shifting demands of work.

Future research might also improve on the limitations of this research. For example, a better measurement for work location should be included. For this research only crude variables regarding work

location were available. Secondly, it would be helpful to be able to include in the analysis detailed work and contact arrangements in terms of time of the day and day of the week for each activity (e.g. Alexander et al., 2010).

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